

What is claimed is:

- Sub A1
- 1 1. A method of forming interconnect, comprising:
- 2 forming a dielectric layer over a substrate, the dielectric layer having
- 3 trenches therein;
- 4 forming a barrier in the trenches and on a top surface of the dielectric
- 5 layer;
- 6 depositing metal over the barrier; and
- 7 polishing the metal with a slurry that includes an abrasive harder than the
- 8 metal and less hard than the barrier.
- 1 2. The method of Claim 1, wherein the dielectric layer comprises an oxide of
- 2 silicon, and the barrier is electrically conductive.
- 1 3. The method of Claim 1, wherein the dielectric layer comprises a
- 2 fluorinated oxide of silicon, and the barrier is selected from the group consisting
- 3 of tantalum, and tantalum nitride.
- 1 4. The method of Claim 1, wherein the abrasive has a Moh's hardness
- 2 between approximately 3.5 and 6.
- 1 5. The method of Claim 4, wherein the slurry has a pH between
- 2 approximately 3.5 and 7.

1 6. The method of Claim 4, wherein the slurry contains approximately 0.5% to
2 10% by weight of the abrasive.

1 7. The method of Claim 1, wherein the slurry contains an oxidizer comprising
2 H₂O₂.

1 8. The method of Claim 1, wherein polishing comprises chemical mechanical
2 polishing.

1 9. The method of Claim 1, wherein the dielectric layer comprises SiOF, the
2 barrier layer comprises tantalum, depositing comprises plating, and the abrasive
3 comprises one or more materials selected from the group consisting of iron
4 oxide, strontium titanate, apatite, diopside, iron, brass, fluorite, hydrated iron
5 oxide, and azurite.

1 10. The method of Claim 9, wherein the slurry has a pH in the range of 3.5 to
2 7.

1 11. A method of polishing a first film overlying a second film wherein the
2 second film is harder than the first film, comprising:
3 polishing the first film with a slurry comprising an abrasive having a
4 hardness greater than a hardness of the first film and less than the hardness of
5 the second film.

1 12. The method of Claim 11, wherein the first film comprises copper and the
2 second film is comprises a material selected from the group consisting of
3 tantalum and tantalum nitride.

1 13. The method of Claim 12, wherein the abrasive comprises a material
2 selected from the group consisting of iron oxide, strontium titanate, apatite,
3 diopside, iron, brass, fluorite, hydrated iron oxide, azurite, and combinations
4 thereof.

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1 14. The method of Claim 13, wherein the abrasive comprises approximately
2 0.5 to 10 wt.% of the slurry.

1 15. A slurry, comprising:
2 an oxidizer;
3 a corrosion inhibitor;
4 a buffer system; and
5 an abrasive;
6 wherein the slurry is characterized by providing a high Cu polish rate, a
7 low Cu etch rate, and a high selectivity to a Cu diffusion barrier when used for
8 chemical mechanical polishing.

1 16. The slurry of Claim 15, wherein the Cu diffusion barrier comprises Ta.

1 17. The slurry of Claim 15, wherein the Cu diffusion barrier comprises TaN.

1 18. The slurry of Claim 15, wherein the abrasive is harder than Cu and less
2 hard than the Cu diffusion barrier.

1 19. A slurry, comprising:

2 an oxidizer; a corrosion inhibitor; a buffer system; and an abrasive;

3 wherein the abrasive is harder than a Cu diffusion barrier, and less hard than a
4 dielectric material.

1 20. The slurry of Claim 19, wherein the Cu diffusion barrier comprises a
2 material selected from the group consisting of Ta and TaN; and the dielectric
3 material comprises a material selected from SiO₂ and SiOF.

1 21. A slurry, comprising:

2 an oxidizer; a corrosion inhibitor; a buffer system; and an abrasive;

3 wherein the abrasive is harder than Cu, and less hard than a Cu diffusion barrier,
4 and less hard than a dielectric material.

1 22. The slurry of Claim 21, wherein the Cu diffusion barrier comprises a
2 material selected from the group consisting of Ta and TaN; and the dielectric
3 material comprises a material selected from the group consisting of SiO₂ and
4 SiOF.

1 23. The slurry of Claim 22, wherein the abrasive comprises hydrated iron
2 oxide.

1 24. A method of forming a damascene structure, comprising:
2 forming trenches in an insulating layer disposed on a substrate, the
3 trenches having a bottom surface and side surfaces;
4 forming a barrier layer over a top surface of the insulating layer and over
5 the bottom and side surfaces, the barrier layer having a first hardness;
6 forming a layer of metal over the barrier layer; and
7 removing the metal layer from over the that portion of the barrier layer that
8 overlies the top surface of the insulating layer;
9 wherein removing the metal layer comprises polishing the metal with a
10 slurry having an abrasive that is harder than the metal and less hard than the
11 barrier layer.

1 25. The method of Claim 24, wherein the metal comprises copper, the barrier
2 layer comprises tantalum nitride, and the dielectric layer comprises a fluorinated
3 oxide of silicon; and further comprising removing the barrier layer by polishing
4 with the slurry.

- 1 26. The method of Claim 25, wherein the abrasive comprises a material
2 selected from the group consisting of iron oxide, strontium titanate, apatite,
3 diopase, iron, brass, fluorite, hydrated iron oxide, and azurite.

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- 1 27. A slurry for polishing copper overlying a barrier layer, comprising:
2 water;
3 hydrogen peroxide;
4 a corrosion inhibitor;
5 a pH buffer; and
6 an abrasive;
7 wherein the abrasive has a hardness between hardness of copper and a
8 hardness of the barrier layer.

- 1 28. The slurry of Claim 27, wherein hydrogen peroxide comprises 2 to 4 wt. %
2 of the slurry; and the abrasive comprises 0.5 to 10 wt. % of the slurry.

- 1 29. The slurry of Claim 28, wherein the corrosion inhibitor comprises 0.015 to
2 0.045 M benzotriazole.

- 1 30. The slurry of Claim 29, wherein the slurry has a pH in the range of
2 approximately 3.5 to 7.

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